

**SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT:
MANAGEMENT OF WOLF CONFLICTS AND DEPREDATING WOLVES
IN MICHIGAN**

Agency Draft
December 2009

In 2006, the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (WS) and the United States Department of the Interior, Fish and Wildlife Service (USFWS) in consultation with the Michigan Department of Natural Resources (MDNR) prepared an Environmental Assessment (EA) on the potential environmental impacts of alternatives for managing gray wolf (*Canis lupus*) damage and conflicts in Michigan (USDA 2006). After consideration of information in the EA and public comments, on May 8, 2006, the federal agencies chose Alternative 2, Integrated Wildlife Damage Management, as the strategy to address wolf damage and conflicts in Michigan. The alternative permitted use of the full range of nonlethal and lethal methods to reduce wolf damage, and included USFWS issuance of a permit for the lethal take of depredating wolves. On August 9, 2006, a U.S. District Court in the District of Columbia enjoined the permit¹ and all lethal take of wolves for depredation management was discontinued until March 12, 2007, when a February 8, 2007, USFWS decision to remove wolves from the federal list of threatened and endangered species went into effect (wolves were delisted). The March 12, 2007, delisting and a similar decision that went into effect on May 4, 2009, were challenged in court and, in each instance, status as an endangered species was restored (Table 1). While wolves have been federally-listed, the agencies have managed wolves in accordance with the 2006 EA and Decision with the exception that permits were not issued for the take of wolves for damage management. After the July 2, 2009, court settlement which returned wolves to endangered status, the MDNR requested a new permit to use aversive conditioning (e.g., shock collars; Hawley et al. 2009), nonlethal projectiles, and lethal methods to reduce wolf damage and conflicts. This supplement was prepared to update the analysis in the 2006 EA and to reevaluate USFWS options for the issuance of permits to the MDNR for wolf management in Michigan.

The ESA and an Endangered Species Act Section 6 Cooperative Conservation Agreement with the USFWS grant the MDNR authority to conduct many types of wolf management and wolf damage management activities without the need for a permit from the USFWS. In states with Cooperative Conservation Agreements, any qualified and authorized employee or similarly qualified and authorized agent of the state conservation agency may take an endangered species without a permit or 4(d) rule from the USFWS provided the taking is not reasonably expected to result in: 1) the death or permanent disabling of the specimen; 2) the removal of the specimen from the state where the taking occurred; 3) the introduction of the specimen to an area outside the historical range of the species; or 4) holding the species in captivity for a period of more than 45 days. (50 CFR 17.21 (c)(5)). Additionally, under the ESA, anyone can take a wolf in response to an immediate and demonstrable threat to human life (i.e., when a wolf is attacking a person) without a permit from the USFWS. The ESA also grants the USFWS, federal land management agencies, MDNR or their designated agents (e.g., WS) the authority to take wolves in cases of non-immediate but demonstrable threats to human safety without a permit from the USFWS. The USFWS, MDNR, federal land management agencies, or their designated agents, may take a wolf to aid a sick or injured wolf.

¹ Instead of contesting the Court's decision, the USFWS chose to pursue the removal of wolves from the federal list of threatened and endangered species. However, the Safari Club International and Safari Club International Foundation were interveners on the case and continued to pursue the issue. In 2008, a three judge appellate panel vacated the District Court's opinion.

Table 1. Summary of wolf status and management since the completion of the EA on wolf damage management in 2006 (USDA 2006).

	Date – Federal Status of Wolves					
	Apr. 24, 2006 – Aug. 9, 2006	August 9, 2006 – March 11, 2007	March 12, 2007 – Sept. 29, 2008	Sept. 29, 2008 – May 4, 2009	May 4, 2009 – June 2, 2009	June 2, 2009 – Present
Management Methods	Endangered	Endangered	Delisted	Endangered	Delisted	Endangered
Nonlethal methods that do not involve take*	Available to all	Available to all	Available to all	Available to all	Available to all	Available to all
Capture and relocation and radio activated frightening devices	Available to MDNR and agents through Cooperative Conservation Agreements	Available to MDNR and agents through Cooperative Conservation Agreements		Available to MDNR and agents through Cooperative Conservation Agreements		Available to MDNR and agents through Cooperative Conservation Agreements
Aversive Conditioning and Nonlethal Projectiles	Permit from USFWS granted	Not Available	Available with Permit from MDNR	Not Available	Available with Permit from MDNR	Not Available
Lethal methods for immediate threat to human safety	Available to all	Available to all	Available to all	Available to all	Available to all	Available to all
Lethal methods for non-immediate threat to human safety	Available to qualified agency and tribal personnel	Available to qualified agency and tribal personnel	Available with Permit from MDNR	Available to qualified agency and tribal personnel	Available with Permit from MDNR	Available to qualified agency and tribal personnel
Lethal methods to aid sick or injured wolf	Available to qualified agency and tribal personnel	Available to qualified agency and tribal personnel	Available to qualified agency and tribal personnel	Available to qualified agency and tribal personnel	Available to qualified agency and tribal personnel	Available to qualified agency and tribal personnel
Lethal methods to reduce predation on domestic animals	Permit from USFWS granted to qualified agencies.	Not Available	Available with Permit from MDNR	Not Available	Available with Permit from MDNR	Not Available

* Permitted methods include animal husbandry practices, habitat modification, physical exclusion, compensation for damage, guarding and hazing, and frightening devices which do not involve capture of or contact with wolves.

The MDNR Permit request for the use of lethal WDM is similar to that analyzed in the 2006 Wolf EA and proposes the same level of take analyzed for Alternative 2 of the EA (10% of the previous winter wolf population). If the permit for lethal take of wolves for depredation management is issued, lethal removal of wolves would only be conducted under the following conditions:

- 1) The depredation must be verified by appropriately trained and authorized personnel.
- 2) The depredation is likely to be repeated.
- 3) The depredation occurred on lawfully present domestic animals. Lethal methods would not be used to address depredations by wolves on pets running at large or hunting and training on public lands.
- 4) Taking, wolf handling and euthanizing must be carried out in a humane manner and may include the use of foothold traps, snares, shooting, and/or lethal injection.
- 5) Taking of wolves will only occur within 1 mile of the depredation site.
- 6) Traps and snares will be checked at least once every 24 hours.
- 7) Pups of the year captured before August 1 will be released.
- 8) Lactating females trapped before July 1 must be released near the point of capture unless they have been involved in chronic depredation problems (i.e., three or more depredation events); in which case lactating females may be captured and euthanized.
- 9) Lethal WDM methods may not be implemented at livestock operations or on other private lands that fail to follow technical assistance guidelines in a timely manner.
- 10) If a depredation has not occurred in the current calendar year, lethal WDM methods may only proceed if: 1) verified depredation occurred at the site, or in the immediate vicinity during the previous year; 2) there is strong evidence one of more members of the depredating pack has remained in the area since the verified depredation; 3) based on wolf behavior and other factors, the depredation is likely to be repeated; and 4) trapping is conducted in a location and a manner to minimize the likelihood that a wolf or wolves from a non-depredating pack is captured.

In addition to evaluating the applicant's request, the USFWS will consider whether to authorize lethal take of wolves for a study designed to compare the efficacy and impacts of nonlethal and lethal strategies for wolf depredation management. This proposed research is considered in a separate Alternative (Alternative 5 - Research Option). The Research Option would involve comparing sites using nonlethal methods for wolf damage management to sites using lethal methods for wolf damage management (See Section 3.4 below). Under the Research Option, only some of the sites involved in the study would be able to use lethal methods for WDM. The remaining study sites and all sites which are not included in the research project will only use nonlethal methods for wolf damage management. Consequently, the total lethal take of wolves for the Research Option would be less than the take if the MDNR damage management permit request is granted (Alternative 2).

I. PURPOSE

The purpose of the 2006 EA was to evaluate the potential impacts of alternatives for managing conflicts with wolves and wolf damage in Michigan including actions that may be taken with permits issued by the USFWS under Section 10(a)(1)(A) of the ESA. Management activities would be intended to protect agricultural resources, pets, and human health and safety in Michigan, and to conserve wolf populations. This supplement has been prepared to aid the USFWS in reviewing a 2009 permit application requesting a permit to use specific nonlethal and lethal WDM methods throughout the State, and a request to conduct a research project comparing the efficacy and impacts of nonlethal and lethal WDM strategies (Research Option). This EA Supplement also provides data on the wolf population and WDM activities that have been conducted since the completion of the 2006 EA.

When preparing this supplement, the agencies reviewed information from the scientific literature and other wolf management information obtained by WS, the USFWS and the MDNR since the completion of

the 2006 EA. Of particular importance is the “Review of Social and Biological Science Relevant to Wolf Management in Michigan” prepared by Beyer et al. (2006) to support the development of the 2008 Michigan Wolf Management Plan (MDNR 2008a) and the MDNR Requirements and Guidelines for Management of Wolf Depredation (MDNR 2008b).

II. DECISION TO BE MADE

In 2006, the USFWS and WS issued separate decisions based on the EA and associated public comments. Both agencies selected Alternative 2, Integrated Wolf Damage Management, as the management strategy to be used. For the USFWS, selection of Alternative 2 meant issuing permits for the use of shock collars, nonlethal projectiles, and limited lethal take of wolves to reduce wolf predation on domestic animals. The USFWS decision to issue the permits was overturned by the federal court in 2006. Instead of contesting the Court’s decision, the USFWS pursued removal of the wolf from the federal list of threatened and endangered species. The delisting went into effect on March 12, 2007. However, the Safari Club and Safari Club International Foundation were interveners on the case and continued to pursue the litigation regarding permits. On June 3, 2008, an appellate panel vacated the Court’s opinion regarding the issuance of permits. On September 29, 2008, the court also vacated the USFWS decision to delist wolves and restored protection for the gray wolf under the ESA. The USFWS subsequently attempted to delist the wolf, but has not been successful in doing so.

Given that wolves have been restored to endangered status, and that the court decision denying the issuance of permits for lethal WDM was vacated; the MDNR has asked the USFWS to reconsider the issue of permits for lethal WDM.

The USFWS is evaluating its alternatives including the issuance of a permit that is fully responsive to the Applicant’s request (i.e., nonlethal and lethal WDM – Alternative 2). The USFWS is also considering whether to issue a permit for a research project designed to evaluate the efficacy and impacts of nonlethal and lethal WDM strategies (Research Option – Alternative 5). Implementation of the Research Option would be conducted instead of (not in addition to) the usual wolf damage management response at study sites, and would have lower lethal take of wolves than proposed in the MDNR permit request.

For WS, selection of Alternative 2 in 2006 meant WS would use the full range of legally available methods to reduce damage by and conflicts with wolves. The court decisions have not changed WS’ management decision; they have just limited the list of wolf damage management methods legally available to WS. The impact of USFWS decisions regarding the issuance of permits for WDM on actions by the WS program is addressed in the 2006 EA (Section 3.0). WS selection of Alternative 2 in the 2006 EA allows for WS involvement in wolf research if the research does not result in cumulative impacts in excess of those analyzed for WS’ chosen management alternative (Alternative 2). As noted above, USFWS selection of the new Research Option would have a lower lethal take of wolves than proposed under Alternative 2 which was selected by WS in the 2006 EA. WS has monitored the impacts of WDM actions in Michigan and available research on wolf management since the completion of the 2006 EA and has determined that a new Decision is not warranted at this time (USDA 2009).

III. NEED FOR ACTION

3.1 Wolf Predation on Livestock and Pets

Wolf predation on livestock and pets remains as described in EA Sections 1.3.7. Updated information on livestock losses to wolf predation is provided in Figure 1 and Tables 2 and 3 below.

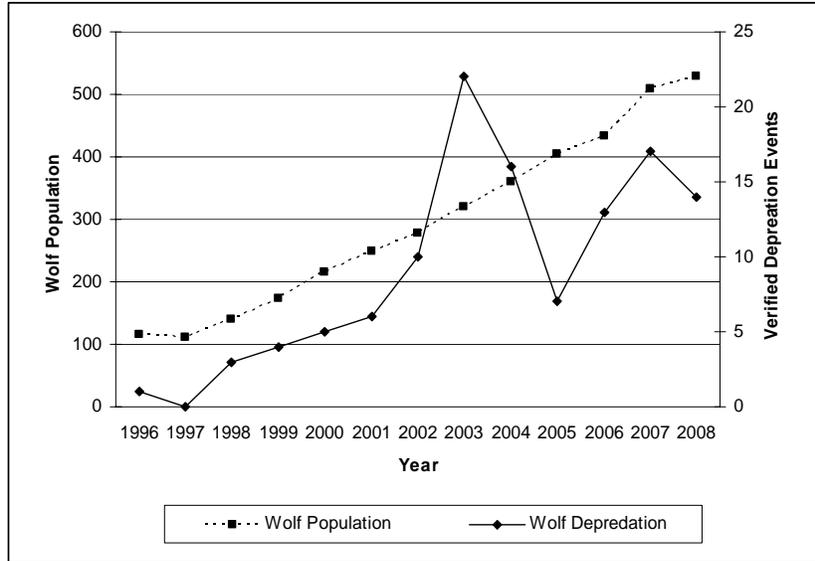


Figure 1. Annual incidence of verified wolf depredation on livestock and pets (depredation events) and annual minimum wolf population estimates in Michigan (D. Beyer, MDNR, unpublished data 2009).

The number of wolf depredation events in Michigan increased as the wolf population increased until 2003-2004 when wolves were listed as threatened and a 4(d) rule was in effect which allowed for the use of integrated WDM including lethal wolf removal in response to wolf damage and conflicts (Fig. 1). Since that time, access to the full range of WDM methods has varied (Table 1). This variability in access to damage management techniques, time of year when specific methods were available (e.g., whether all methods were available at times of the year when predation is most likely to occur), and natural variability in biological systems likely combined to contribute to the subsequent annual fluctuations in verified depredation events.

Table 2. Summary of verified wolf depredation events in Michigan (D. Beyer, MDNR, unpublished data. 2009).

Year	Cattle	Sheep	Chickens	Dogs	Cervids	Totals
1996	0	0	0	1	0	1
1997	0	0	0	0	0	0
1998	3	0	0	0	0	3
1999	1	0	0	3	0	4
2000	2	1	2	0	0	5
2001	3	0	0	3	0	6
2002	4	0	1	5	0	10
2003	11	1	1	9	0	22
2004	7	2	0	5	2	16
2005	2	2	1	2	0	7
2006	8	1	1	3	0	13
2007	12	2	0	3	0	17
2008	10	0	4	0	0	14
Total	63	9	10	34	2	118

Table 3. Summary of verified wolf depredation on domestic animals (number of animals killed or injured) in Michigan (D. Beyer, MDNR, unpublished data. 2009).

Year	Dogs	Cattle	Sheep	Domestic Poultry*	Game Birds	Rabbits	Cervids	Totals
1996	1	0	0	0	0	0	0	1
1997	0	0	0	0	0	0	0	0
1998	0	3	0	0	0	0	0	3
1999	3	1	0	0	0	0	0	4
2000	0	2	1	8	0	0	0	11
2001	3	3	0	0	0	0	0	6
2002	6	4	0	21	0	0	0	31
2003	11	11	2	13	0	0	0	37
2004	4	7	3	0	0	0	2	16
2005	3	2	7	1	0	0	0	13
2006	4	9	4	35	0	0	0	52
2007	5	17	7	0	0	0	0	29
2008	0	13	0	50	40	12	0	115
Totals	40	72	24	128	40	12	2	318

* Domestic poultry includes chickens, ducks, geese and turkeys.

Wolves are social animals and young of the year probably learn to identify acceptable prey items from adults (Fuller et al. 2003). An assessment of factors which may have increased wolf depredations in Minnesota suggested that wolf colonization, range expansion, and learning seemed to contribute to depredation increases (Harper et al. 2008). Even though one or 2 pack members may actually depredate livestock, the adults often move the entire pack to farms and establish rendezvous sites where kills have been made at which point the entire pack including young of the year are exposed to livestock routinely. This exposure likely predisposes wolves to prey on livestock in the future. Additionally, prey populations, such as white-tailed deer, are typically higher around agriculture areas, which may attract wolves to farms and increase risks of wolf/livestock conflicts.

3.2 Indirect Impacts of Livestock Predation

Wolf impacts on livestock are not limited to death and injury of animals and are discussed in EA Section 1.3.6; Lehmkuhler et al. (2007), and Kleuver et al. (2009). The presence of predators near cattle can invoke a fear response in the cattle. Fear is a strong stressor and can result in disease and weight loss, reduce the value of meat, and interfere with reproduction. In a study by Kleuver et al. (2009), cattle exposed to a combination of wolf effigies, wolf scat and wolf urine exhibited increased vigilance behavior and decreased foraging rates. The stress of being repeatedly chased can cause cattle to abort calves, calf early or give birth to a weak calf. Harassment by predators may also cause livestock to become nervous or aggressive which can increase risk of injury to humans working with the animals and to nearby cattle. Cattle sometimes run through fences when being chased by wolves which results in costs to repair the fence, time and cost in locating the missing animals, and veterinary expenses for animals injured by the fence. Producers with wolf predation problems also spend extra time on herd surveillance in addition to the time spent dealing with the damage.

3.3 Wolf-Dog Hybrids

The issue of wolf-dog hybrids was not addressed in the 2006 EA but is a concern for the USFWS and MDNR. A wolf-dog hybrid is the offspring of the mating of a wolf with a domestic dog (*Canis familiaris*). Normally these are bred in captivity and these animals tend to be intelligent,

semi-wild, independent, and have, to varying degrees, retained normal “predatory behaviors” of wild wolves. However, like domestic dogs, hybrids usually lack a fear of humans. These characteristics can make wolf-dog hybrids highly unpredictable and difficult to manage. It is common for owners of wolf-dog hybrids to find themselves with an animal they lack the knowledge and skill to handle.

Injuries and deaths caused by wolf-dog hybrids have received national media attention. The death of a four year old in Florida in August, 1988 by a wolf that, just two hours earlier, had been adopted from an animal shelter set a national precedent for animal shelters/agencies: wolf-dog hybrids are to be put down or returned to their original owner, but are not to be adopted out to an uneducated, unsuspecting public. This policy makes it difficult for owners of hybrids to find good homes for animals they cannot manage. Unfortunately, many overwhelmed hybrid owners resort to "setting their wolf-dog hybrid free" when they cannot find a suitable home for it. These freed hybrids generally lack the hunting skills and pack structure needed to survive by hunting wild prey. When these animals become hungry they instinctively return to humans for food and often are shot by local enforcement officers. Most years, WS receives 1-2 requests from the public or agency personnel regarding a suspected wolf hybrid or wolf-like free-ranging dog.

Free-roaming hybrids are often mistaken for wild wolves. The problems they cause reflect badly on wild wolves and adversely impact the social tolerance for wild wolves. Additionally, wolf-dog hybrids interbreeding with wild wolves are viewed as a threat to the gene pool of wolves. Wolf traits are important to survival in the wild (Hope 1994). Dog genes in a wolf population threaten the long term viability of the wolf population.

The MDNR and USFWS may ask WS to remove wolf-dog hybrids either because the hybrids were causing a damage problem or a human health and safety risk, or because the animals were interbreeding with wild wolves and posing a risk to the genetics of the native Michigan wolf population. Determining if an animal is a wolf-dog cross or wolf-like dog is often very difficult under field conditions. If site investigation by WS and consultation with the MDNR and USFWS, as appropriate, indicates that removal of the animal is warranted, WS will use foot-hold traps and cable restraints to live-capture the animal. If the animal has identification (e.g., collar) it is returned to the owner. All other suspected wolf-dog hybrids are turned over to the MDNR for holding until genetic analysis may be completed. In the event that wolf-dog hybrids are removed from the wild, these animals will not be included in the numbers authorized for “take” since they are not considered to be part of the wild population of gray wolves (*Canis lupus*).

3.4 Research on Wolf Damage Management (Research Option)

The USFWS is considering issuance of permits for the limited lethal take of wolves for depredation management. Available information indicates that prompt, effective management of depredation problems helps to maintain or improve public tolerance of wolves and is in the best interest of the recovery of the species (EA Sections 1.2 and 2.2.4 and EA Chapter 6 responses to questions 7, 23, and 25-27). However, although information is available on the efficacy of individual WDM methods, little data is available comparing WDM strategies. The current lack of clear, comparative information on the efficacy of these two management approaches fuels debates from those opposed to or in favor of lethal or nonlethal controls. The USFWS has received a proposal to conduct research comparing impacts and efficacy of nonlethal and lethal strategies for addressing wolf depredation on domestic animals (Breck et al. 2009).

The proposed study would be conducted in Wisconsin and/or Michigan on farms where wolves have caused confirmed or probable depredations. Farms with verified wolf depredation on livestock will be assigned to nonlethal or lethal treatment strategies. Assignment of farms to

treatment types will be based on a protocol that minimizes subjective allocation of treatments and maximizes independence of sampling units. Treatments will be applied in accordance with standard protocols including guidelines developed by the MDNR and Wildlife Services for the use of lethal control (e.g., trapping and euthanasia). Properties assigned to the non-lethal treatment will have at least one and possibly a combination of tools applied to scare/repel wolves from livestock. Techniques will include aversive conditioning (trap-collar-release), fladry, and light and scare devices. Implementation of non-lethal tools will not be consistent among farms and will vary primarily based on the size of the farm. However, protocols for the use of various techniques will be followed by all WS specialists implementing the non-lethal treatments. The goal is to maximize the effectiveness of the non-lethal tools by implementing them in ways recommended by previous research and practical experience. While the non-lethal devices are deployed, both the producer and WS specialist will check and maintain the functioning of the devices. MDNR and WS personnel also intend to interview the farmers participating in the study and some of their neighbors on their acceptance of the nonlethal or lethal controls methods. The agencies propose to conduct the research in 2010 and into 2011 if funding is available.

The effectiveness of lethal and nonlethal techniques would be determined by monitoring the following response variables: 1) whether or not another conflict occurred on the property after implementation of the management strategy, 2) time until next conflict on the property, 3) number of conflicts subsequent to the initial conflict, and 4) number of days that wolves were detected on the property (tracks, howls, or visual observation) subsequent to the initial conflict. The agencies will also monitor a variety of variables for each property which may impact the efficacy of the management methods including but not limited to: 1) the size of the property or pasture, 2) proximity of conflict to other conflict areas, 3) number and type of livestock on the property, 4) number of days the treatment was in effect on the property, 5) number of person-hours spent implementing the treatment, and 6) wolf pack size if known. Additionally, an economic cost-benefit analysis will be conducted that compares the costs of each management technique by accounting for the cost of materials, labor, and supplies as well as amount of damage.

In order to evaluate the effects of implementing the Research Option, it is important to note that the level of lethal take associated with conducting the study would be lower than that which would occur if the MDNR permit request is granted. The reduced take would occur because not all damage management sites would qualify for inclusion in the study. Additionally, only a subset of the study sites would be assigned to the lethal damage management treatment. Consequently, the total number of sites where lethal WDM would be used and the associated take of wolves would be less than what would occur if the MDNR permit request is granted.

IV. ISSUES

Issues relevant to the management of wolf damage and conflicts in Michigan are addressed in EA Chapter 2, the Chapter 4 analysis of environmental impacts, and in responses to public comments provided in Chapter 6. Issues addressed in detail in Chapter 4 of the EA include:

- Effects on wolf populations in Michigan
- Effects on public and pet health and safety
- Humaneness of method used for WDM
- Impacts to stakeholders, including aesthetics of wildlife
- Effects on non-target species populations, including T&E species

New issues that have been identified since the completion of the EA and updates to issues discussed in the EA are discussed below.

4.1 Issuance of permit would be contrary to the August 9, 2006 decision by the District Court of the District of Columbia indicating that the issuance of permits for the take of depredating wolves, “contravenes the plain meaning and clear intent of Congress as set forth in Section 10(a)(1)(A) of the Endangered Species Act” (Civil Action No. 06-1279).

Instead of contesting the Court’s decision, the USFWS chose to pursue the removal of wolves from the federal list of threatened and endangered species. However, the Safari Club International and Safari Club International Foundation were interveners on the case and continued to pursue the issue. On June 3, 2008, a three judge appellate panel vacated the District Court’s opinion. The USFWS is mindful of the District Court’s opinion and will consider information from the case in their decision whether or not to issue a permit to the MDNR for lethal take to address depredation or lethal take specifically to implement a proposed research project. It is important to note that the proposed research project is designed to address some of the concerns of the Court by evaluating the efficacy and impacts of WDM methods and public perceptions of WDM.

4.2 How would a new decision by the USFWS impact management decisions and actions by WS and the MDNR?

The relationship among decisions made by the MDNR, WS and the USFWS is discussed in detail in EA Section 3.0. As noted in the EA, the decisions made by the agency with regulatory authority can restrict the actions taken by the other agencies. For example, in WS’ 2006 Decision and FONSI, WS selected the alternative that involves use of the full range of legally available non-lethal and lethal WDM techniques (Alternative 2). However, it is the USFWS’ decision about issuing permits that will determine which methods are available to WS and the MDNR.

4.3 EA should consider the importance of wolves in moderating the impacts of mesopredators (e.g., coyotes) and the role of top predators as a potential buffer to the impacts of global warming on prey species and scavenger populations.

The agencies are aware of recent studies and population models documenting the impact of wolves on the distribution and abundance of coyote populations and associated impacts on ungulate populations (e.g., mesopredator suppression; Beyer et al. 2006, Berger and Gese 2007, Berger and Conner 2008, Berger et al. 2008). For example, coyote densities in study areas in Grand Teton National Park and the Greater Yellowstone Ecosystem varied spatially and temporally in accordance with wolf abundance (Berger and Gese 2007). A strong negative relationship between coyote and wolf densities supported the hypothesis that wolves were limiting coyote populations. Impacts of wolves appeared to be greatest for transient coyotes with 56% of mortality in transient coyotes attributable to wolves. Transient coyotes in areas with abundant wolf populations also had a much higher emigration rate (117%) than transient coyotes in areas without wolves. Data on coyote, pronghorn and wolf populations in the Grand Teton National Park and Bridger Teton National Forest provided evidence that, in some situations, the presence/reintroduction of large carnivore may actually help increase populations of prey species that are heavily impacted by mesopredators (Berger and Conner 2008, Berger et al. 2008). Pronghorn survival was four times higher in areas with wolves and fewer coyotes than in areas with no wolves and higher coyote populations. Based on simulation modeling, Berger and Conner (2008) predicted that the presence of wolves and associated improvements in pronghorn survival could change the pronghorn population growth rate from 0.92 to 1.06, the difference between a slightly decreasing to a slightly increasing pronghorn population.

A model created by Wilmers et al. (2006) demonstrates how the presence of top predators, specifically wolves, can help to stabilize prey population fluctuations. Based on their models, the authors concluded that variation in climate tends to lead to strong fluctuations in age-structured prey populations. Additive mortality from predation helps to suppress the fluctuations in prey populations by slowing the rate of population growth during good years. However, if there are many good years in a row, prey populations may escape the predator pit and reach high densities despite predation. In poor years, the authors predicted that predation would likely be compensatory to other forms of mortality (e.g., starvation, disease), and would help the population. Wilmers et al. (2007) also predict that the presence of wolf-provided carrion could help to buffer climate-induced changes in the availability of carcasses for scavengers. In the absence of wolves, the availability of carcasses is largely dependent upon abiotic factors such as weather, but when wolves are present, carcasses will be generated no matter what other factors are affecting prey populations.

As noted in the EA and the population impacts section of this supplement, Michigan wolf damage management activities, including the lethal removal of wolves, when permitted, has not resulted in a decrease in the state or regional wolf population. In fact, the Michigan wolf population has continued to increase. Implementation of lethal wolf removal for damage management, as described for Alternative 2 is not anticipated to result in an adverse impact on the wolf population. Consequently, wolves would continue to fill their valuable role in Michigan ecosystems.

4.4 The EA should consider the potential positive impacts wolves may have on disease transmission among wild ungulates and between wild ungulates and domestic animals.

Wolf impacts on livestock may not always be negative. High density of host species may lead to higher incidence of disease because of increased disease transmission rates. Some biologists have hypothesized that wolf predation on wild ungulates may help to reduce prevalence of diseases that are detrimental to prey populations and transmissible to livestock (e.g., bovine tuberculosis (*Mycobacterium bovis*), brucellosis (*Brucella abortus*)) by decreasing the size of wild ungulate populations and reducing average group size (Creel and Winnie 2005, Stronen 2007). Others have hypothesized that the ability of wolves to recognize and focus predation efforts on individuals which are not as healthy as herd mates may serve to remove animals early in the process of developing and, potentially shedding, the disease (Associated Press 2003). However, at this time, these hypotheses are untested. Even if these beneficial impacts are proven, the level of lethal wolf removal proposed in Alternative 2 is not likely to have an impact on this issue. The Michigan wolf population has continued to increase despite the fact that wolves have been lethally taken for damage management at intervals since 2003. As discussed in Chapter 4 of the EA, lethal removal of up to 10% of the population for damage management is not anticipated to result in substantive adverse impact on the wolf population. Consequently, the proposed action would not adversely impact any benefits of wolves in terms of reducing disease in wild ungulates and disease transmission between wild ungulates and livestock.

4.5 EA needs to Address Indirect Impacts of Wolves on Livestock.

Wolf impacts on livestock are not limited to death and injury of animals (Lehmkuhler et al. 2007 and Kleuver et al. 2009). The presence of predators near cattle can invoke a fear response in the cattle. Fear is a strong stressor and can result in disease and weight loss, reduce the value of meat, and interfere with reproduction. In a study by Kleuver et al. (2009), cattle exposed to a combination of wolf effigies, wolf scat and wolf urine exhibited increased vigilance behavior and decreased foraging rates. The stress of being repeatedly chased can cause cattle to abort calves,

calf early or give birth to a weak calf. Harassment by predators may also cause livestock to become nervous or aggressive which can increase risk of injury to humans working with the animals and to nearby cattle. Cattle sometimes run through fences when being chased by wolves which results cost to repair the fence, time and cost in locating the missing animals, and veterinary expenses for animals injured by the fence. Producers with wolf predation problems also spend extra time on herd surveillance in addition to the time spent dealing with the damage.

4.6 The MDNR should/should not relocate depredating wolves.

Relocation of depredating animals is one of the damage management tools available to the MDNR and their designated agents because of the Section 6 Cooperative Conservation Agreement with the USFWS. However, in its permit application, the MDNR notes that relocation is no longer a feasible option in the UP because: 1) relocated wolves often do not remain near release sites, and some return to their original territories; 2) given the widespread distribution of wolves across the UP, any relocated wolves would probably be killed by resident packs; 3) relocated wolves may continue to exhibit problem behavior (e.g., human habituated wolves); and 4) relocating wolves gives the false impression that the MDNR is introducing additional wolves to the UP, which contributes to the decline in public support for wolves and MDNR wolf management. Beyer et al. (2006) also noted that Michigan residents have expressed opposition to the release of problem wolves near their communities.

V. ALTERNATIVES

The purpose of this supplement is to analyze the USFWS alternatives for responding to the WDM permit request from the MDNR and the research request. The actions requested by the MDNR are similar to those in the permit request analyzed in the 2006 EA (Alternative 2). Consequently, the first 4 management alternatives have not changed from those described in detail in Chapter 3 of the EA. However, an additional alternative which would allow use of lethal WDM methods only for the proposed research on WDM methods has been added (Alternative 5). The following is a brief summary of program components common to all alternatives and descriptions of the alternatives as they relate to the USFWS decision to issue a Section 10(a)(1)(A) permit for wolf management to the MDNR.

5.1 Factors Common to All Alternatives

- Agencies would conduct wolf damage management in accordance with the Michigan Wolf Management Plan (MDNR 2008a), USFWS permits for WDM, the Eastern Gray Wolf Recovery Plan (USFWS 1992), the MDNR Requirements and Guidelines for Management of Wolf Depredation (MDNR 2008b), and all applicable policies, agreements and guidelines among MDNR, WS, USFWS and the tribes.
- Wolf damage management would be conducted on private or public property in Michigan when the resource owners/ managers (property owners/ land managers) request assistance to alleviate wolf damage, wolf damage is verified by WS, the USFW, MDNR or other agents authorized by the MDNR, and an *Agreement for Control* or other comparable document has been completed.
- The Michigan Requirements and Guidelines for Management of Wolf Depredation (MDNR 2008b) reminds producers that use of open pits for disposal of livestock carcasses or parts is illegal in Michigan. Compensation for wolf depredation will not be available to farms which intentionally maintain this practice
- An incremental approach will be used to address wolf-livestock conflicts based on the severity and frequency of conflicts. When severity and frequency are low, more conservative methods will be applied whereas increasingly aggressive WDM methods may be applied as the severity and frequency of conflicts increase (MDNR 2008b). The

incremental approach will include the integrated application of multiple methods for wolf damage management sequentially or simultaneously to reduce wolf damage and conflicts while minimizing harmful effects of damage management measures on humans, wolves, other wildlife species, domestic animals, and the environment.

- The WS' Decision Model thought process, designed to identify the most appropriate wildlife damage management strategies and their impacts, would be used.
- WDM actions would comply with standard operating procedures outlined in Section 3.5 of the EA.

5.2 Alternative 1 - Non-lethal WDM Only

Under this alternative, the USFWS would not issue permits for the lethal take of wolves to resolve damage problems, but would issue permits for the use of aversive conditioning and nonlethal projectiles such as rubber bullets (EA Section 3.3.3). Aversive conditioning and shock collars involve intentionally using painful stimuli to manage wolf behavior, and the USFWS has determined that, while wolves are federally protected as a threatened or endangered species, permits or other authorizations are required to use these methods. The USFWS has the option of restricting the use of nonlethal projectiles to WS and the MDNR, or the USFWS may grant the MDNR and WS the authority to train and equip personnel outside their agencies to use this method. In its permit request, the MDNR has requested that USFWS grant the MDNR and WS the authority to train and equip landowners/managers to use non-lethal projectiles. Methods that require capture and handling of wolves (e.g. aversive conditioning using shock collars, collar-activated frightening devices) would be conducted only by personnel from the MDNR, WS or the Tribes.

In addition to the nonlethal methods authorized under permits from the USFWS, private individuals and agencies will have access to the non-lethal WDM techniques which do not result in "take" as defined by the ESA and its implementing regulations, and do not require a permit or authorization from the USFWS (EA Section 3.3.1 and Appendix B). These methods include, but are not limited to: animal husbandry practices, installation of fencing and use of livestock guarding animals. The MDNR and their appropriately trained and designated agents may use additional non-lethal techniques involving harassment or handling of wolves without permits from the USFWS (EA Section 3.3.2) including capture and relocation and collar-activated frightening devices like the Radio Activated Guard (EA Appendix B).

The ESA allows for the lethal take of an endangered species in response to a demonstrable (either immediate or non-immediate) threat to human safety and to aid a sick or injured wolf. This type of lethal take does not require a permit from the USFWS and could still occur under this alternative.

5.3 Alternative 2 - Integrated WDM (Proposed Action/No Action Alternative²)

Under this alternative, the full range of practical, effective WDM methods would be available for use in reducing wolf damage and conflicts. The USFWS would issue permits for the lethal take of wolves for depredation management as well as the use of aversive conditioning and nonlethal projectiles. In determining the damage management strategy for a site, preference would be given to non-lethal methods when they are deemed practical and effective. Lethal WDM methods would not be implemented at livestock operations or on other private lands that fail to follow technical assistance guidelines for reducing or preventing wolf depredation in a timely manner.

² Reasons for classifying this as the "No Action" alternative remain as discussed in EA Chapter 3.

In their permit request, the MDNR asked for authority for lethal take of up to 10% of annual wolf population estimate each year.³ Actual annual lethal take of wolves for WDM is anticipated to usually be lower than this level. The annual maximum value of 10% was estimated based on review of a similar WDM program which has been in effect in Minnesota since 1986 and wolf damage management take data from Michigan during periods when lethal methods have been permitted. Study of radio-collared wolves in a Minnesota wildland-agriculture matrix typical of many areas in Minnesota and Michigan by Chavez and Gese (2006) indicates that, although radio collared wolves in Minnesota went through and were in close proximity to farms, few livestock were actually killed. During the 3-year monitoring of wolves from 3 different packs, wolves passed through livestock pastures on 28% of the nights of tracking, were within 1 km of a livestock pasture on 58% of the nights, and were < 5 km from a pasture on 95% of the nights. However, only 8 animals (all young or vulnerable livestock) were killed. This supports the hypothesis that not all wolves are involved in depredation and that livestock predation problems are likely caused by only a small portion of the wolf population. Consistent with the proposal in this alternative, Chavez and Gese (2006) recommended an integrated strategy for managing wolf depredation on livestock that included maintaining healthy wild prey populations, encouraging effective and proper animal husbandry practices (e.g., carcass disposal), and removing wolves that kill livestock.

The MDNR has also requested that USFWS grant the MDNR and WS the authority to train and equip landowners/managers to use non-lethal projectiles such as rubber bullets.

5.4 Alternative 3 - Technical Assistance Only and Alternative 4 - No Federal WDM in Michigan

The USFWS action would be identical under both alternatives. Specifically, the USFWS would not issue any Section 10(a)(1)(A) permits for wolf damage management (e.g., use of aversive conditioning, nonlethal projectiles, and lethal removal) nor would the USFWS permit the lethal take for the WDM research project. Individuals with wolf damage problems could still use the nonlethal methods available to all without a permit from the USFWS (EA Section 3.3.1). The State could operationally use and authorize others to use many non-lethal WDM techniques under authority granted by the Section 6 Cooperative Conservation Agreements (Section 3.3.2). As with Alternative 1, lethal take for the protection of human safety and to aid a sick or injured wolf would be permitted under authority granted by the ESA.

5.5 Alternative 5 – Research Option - Permit for Lethal Removal Only Issued for WDM Research

Under the Research Option, farms with wolf depredation which meet study criteria would be included in the research project. Study sites would be assigned to a “nonlethal damage management” treatment or a “lethal damage management” treatment. Other sites will not meet criterion for inclusion in the study or the landowner/manager may choose to not participate in the study. Consequently, lethal damage management will only be conducted at a portion of the sites which might qualify for lethal WDM if the USFWS were to issue permits under Alternative 2. Total lethal take under Alternative 5 would be lower than the MDNR WDM permit request for lethal take of up to 10% of the previous winter’s wolf population.

³ These estimates are derived from surveys conducted during late winter, prior to pup production, when population size is at an annual low.

VI. ENVIRONMENTAL IMPACTS

This section focuses on the environmental impacts of Alternatives 2 and 5. Environmental impacts of Alternatives 1-4 have not changed from those analyzed in the EA. However, since the EA was completed, lethal WDM similar to that proposed in Alternative 2 has been conducted under permits, authority granted by the ESA and while wolves were delisted. Analysis of information on the wolf population since the completion of the EA provides a valuable opportunity to review whether the conclusions based on the impact assessments in the EA are still valid. Alternative 5 is a new alternative which requires analysis at this time.

6.1 Impact on Wolf Population

6.1.1 Alternative 2 - Integrated WDM (Proposed Action/No Action Alternative).

The EA contains a detailed discussion of the impacts of each alternative on the wolf population. This section evaluates the data on the Michigan wolf population that has become available since the 2006 EA was completed and determines whether the impacts on the wolf population are consistent with the predictions and impact analysis in the EA.

The MDNR carefully monitors the state wolf population including conducting an annual survey of the wolf population and radio collaring and monitoring wolves from known packs. Data indicate the Michigan gray wolf population has increased 42% from the 2005 population estimate of 405 wolves in 87 packs to approximately 575 wolves in 108 packs in 2009 (Fig. 1 and Table 4). This increase has occurred in spite of wolf removals for damage management and wolf mortality from other causes including disease, collisions with vehicles, illegal killing and other factors (Tables 3 and 4, Fig. 3).

Factors Impacting the Michigan Wolf Population

Available habitat, prey density, and prey vulnerability are important in determining what areas wolves inhabit and the number of wolves that can be sustained by a given area. The Michigan wolf population grew at an average of 11% annually over the period from 2002-2009 (Table 3 and Fig. 3), and it is unlikely that prey or habitat availability has been limiting the wolf population in the state. However, biologists anticipate that the wolf population in the Upper Peninsula should eventually stabilize as has been the case in Minnesota (Erb 2008).

The unintentional (e.g., vehicle collisions) and intentional (e.g., authorized take, poaching) killing of wolves by humans also is important in determining the distribution and density of wolf populations (Fuller et al. 2003). Illegal killing of wolves still occurs in Michigan. At least four of the nine (44%) known wolf mortalities⁴ which occurred between the September 28, 2008 relisting of wolves and February 26, 2009 were due to illegal killing, and illegal killing accounted for 40% of the radio collared wolf mortality that occurred from 1999-2004 (Beyer et al. 2006, MDNR 2009). It's likely that other illegal wolf killing occurs but is undetected and not represented in these data. The MDNR reports that the rate of illegal wolf killing is increasing as is the frequency of wolf complaints and negative media reports. Without access to the full range of effective WDM methods, the MDNR is concerned that public support will continue to decline and the frequency of illegal actions will continue to increase.

⁴ Information on known wolf mortalities includes data on wolves that were not radio collared.

Table 3. Michigan estimated wolf population and known mortality.

Year	Estimated Wolf Population at End of Previous Winter*	Known Mortality after Population Estimate	Wolves Euthanized	% of Late-winter Population Euthanized	Total % Mortality of Late-winter Population
2000	216	26	0	0	12.0
2001	249	27	0	0	10.8
2002	278	62	1	0.3	22.3
2003	321	22	4	1.2	9.5
2004	360	37	6	1.6	10.3
2005	405	40	2	0.5	9.9
2006	434	32	6	1.4	7.3
2007	509	21	13	2.6	4.1
2008	528	25	5	0.01	4.7
2009	575	NA	NA	NA	NA

*Isle Royale wolves are not included

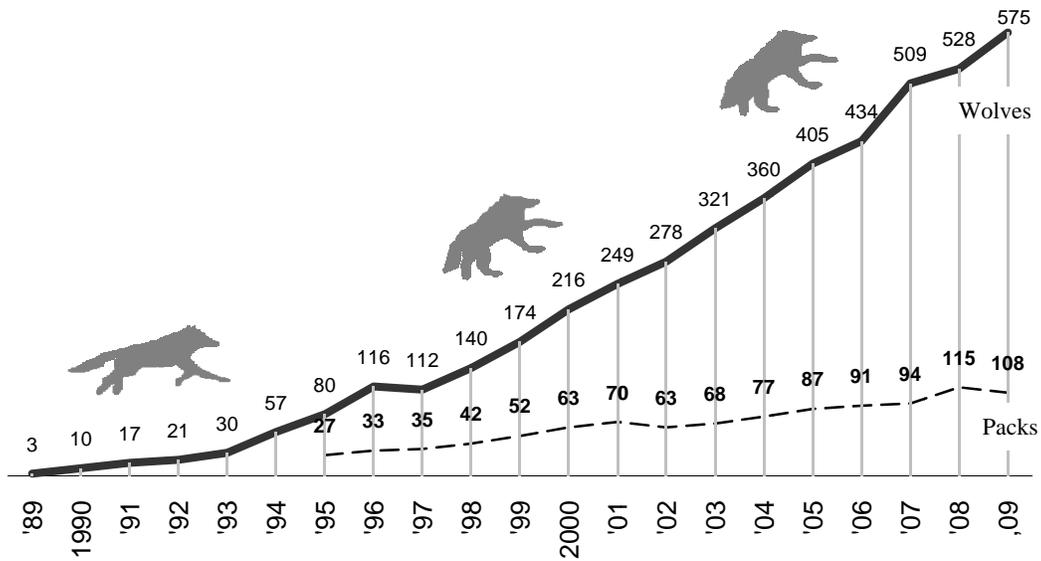


Figure 3. Changes in Michigan gray wolf population 1980-2009 from mid-late winter population surveys (Roell et al. 2009). Population size and pack estimates do not include wolves from Isle Royale.

Table 4. Causes of mortality for radio-collared wolves in the Upper Peninsula of Michigan for bioyears (April 15-April 14) 2001 - 2008 (Table adapted from Roell et al. 2009). The number in parenthesis is the percentage of radio-collared wolves dying from various causes compared to total mortality (natural and human caused) observed in radio-collared wolves.

Mortality Factor	2001	2002	2003	2004	2005	2006	2007	2008	Total
Vehicle	0	2	3	0	3	2	5	3	18
Illegal kill*	3	5	3	7	4	6	4	5	37
Trauma-human	0	0	2	0	0	0	0	0	2
Depredation	0	0	1	0	2	2	2	0	7
Mange	3	1	1	2	4	4	1	0	16
Wolf kill	0	1	0	1	0	3	0	0	5
Other**	0	0	1	2	0	1	1	0	5
Unknown trauma	1	1	1	0	0	0	0	1	4
Unknown	1	1	0	1	1	2	0	0	6
Total	8	11	12	13	14	20	13	9	100

* Illegal kill includes presumed mortality based on the collar being cut off.

** Other includes mortality from natural causes such as stress, pulmonary congestion and renal failure.

Wolf populations do not appear to be greatly affected by other human factors such as snowmobiles, vehicles, or logging activities, except when they result in accidental or intentional killing of wolves or changes in prey density (Fuller et al. 2003). If the wolf population is large enough, even when these factors have an adverse effect on individuals, these activities seem to have little effect on the wolf population (Fuller et al. 2003). From 15 April 2001- 14 April 2008, 18 wolves are known to have been killed in Michigan as a result of vehicle collisions. This level of mortality has not inhibited the increase of the Michigan wolf population over the same period (Table 4).

Source populations are important in establishing new populations and maintaining populations that are heavily harvested or experience high mortality from other causes (Fuller et al. 2003). Michigan's wolf population, excluding Isle Royale, has met state recover goals (200 wolves) for over 10 years and is not presently subject to heavy harvesting or other forms of excessive mortality, so connectivity with source populations in Wisconsin, Minnesota, and Canada is probably of lesser importance at this time. However, movements of wolves among Minnesota, Wisconsin and Michigan have been confirmed and there is also evidence of wolf movements between the eastern Upper Peninsula and Ontario across Whitefish Bay and the St. Mary's River (Beyer et al, 2006). Immigration may not have a large annual effect on the Michigan wolf population but it likely contributes to genetic diversity and the long-term sustainability of the population.

Status of Regional Wolf Population

The gray wolf population in the western Great Lakes states has exceeded the numerical recovery goals as listed in the Federal and State recovery plans (EA Section 1.3.2). The Federal plan requires that at least two viable wolf populations must exist within the eastern United States. One of these populations must be reestablished outside of Minnesota and Isle Royale. The Federal recovery plan provides two alternatives for reestablishing this second viable wolf population. If the wolf population is more than 100 miles from the Minnesota population, it must contain 200 wolves for at least 5 consecutive years (USFWS 2003). If the wolf population is less than 100 miles from the Minnesota population, it must contain at least 100 wolves for at least 5 consecutive years (USFWS 2003). The Michigan/Wisconsin wolf population is less than 100 miles from Minnesota and 2008/2009 survey data indicate there are more than 1,219 wolves in these two states. The Federal recovery plan also requires that the wolf population in Minnesota

be stable or growing, and that its continued survival must be assured. In Minnesota, the wolf population size is not surveyed or estimated annually, however during the winter of 2007-2008, the Minnesota Department of Natural Resources (MNDNR) conducted a new survey of wolf distribution and abundance in Minnesota (Erb 2008). The survey estimated that there were 2,921 wolves (range 2,192 – 3,525) in the state. Comparison of total wolf range, occupied range and population size over the last 10 years suggests that the Minnesota wolf population has been, on average, geographically and numerically stable (Erb 2008).

Impact of the Proposed Action

The EA concluded that the proposed action would not have an adverse impact on the state wolf population. Data on wolves taken for damage management and the status of the wolf population in Michigan and the Western Great Lakes Region support this conclusion. The Michigan wolf population has continued to increase despite wolf removal for damage management and all other forms of mortality. Based on this information, the analysis in the EA, and the information above, we conclude that the USFWS issuance of permits for the intentional take of up to 10% of the Michigan wolf population would not result in adverse impacts on the state wolf population.

6.1.2 Alternative 5 – Research Option - Permit for Lethal Removal Only Issued for WDM Research

Under this alternative, intentional lethal take of wolves would be restricted to approximately half the sites with verified livestock depredation, and the relatively rare instance of wolf take to protect human safety or to aid a sick or injured wolf. The number of sites where lethal WDM may be used to reduce damage for the study will likely be lower than half the total sites with verified wolf depredation depending on study design and cooperator willingness to participate in the study. The exact number of wolves that might be taken for the research project would be difficult to predict because it would depend on whether the depredation is caused by an individual wolf or a pack, pack size, and the degree of removal required to address the depredation problem (i.e., can the problem be solved by only removing a few members of a pack). However, intentional lethal wolf take under this alternative is not expected to exceed 70% of the maximum that would have been permitted under Alternative 2 and is likely to be closer to 50% of that which would occur under Alternative 2. For the same reasons provided for Alternative 2 in the EA and this supplement, this level of lethal take would not adversely impact the state wolf population.

6.2 Humaneness

6.2.1 Alternative 2 - Integrated WDM (Proposed Action/No Action Alternative)

A 2005 public attitude survey of Michigan residents provides insight regarding public perceptions of specific wolf management methods (Beyer et al. 2006). Selectively killing problem wolves to reduce wolf depredation on livestock, hunting dogs, and pets was supported by 75% of interested citizens. Seventy-four percent of interested citizens supported use of live capture and relocation to reduce wolf depredation problems. However, support for relocation was higher among southern Michigan respondents (72%) than among residents of the Upper Peninsula (53%). Among interested citizens, the use of shooting was generally preferred over the use of trapping and there was higher approval of the issuance of a limited number of hunting and trapping permits to reduce wolf abundance than the use of the same methods by hired professionals. The option of leaving the wolves alone in response to wolf depredation on livestock was opposed by 67% of respondents statewide.

Respondent approval of wolf management alternatives often varied depending on the type of problem to be addressed and the region of the state (Beyer et al. 2006). For example, reducing wolf population size by killing a portion of the animals was supported by 49% of respondents when proposed to reduce predation on deer, but was supported by 59% of respondents when proposed to address public safety concerns. In general, residents of the Upper Peninsula were more supportive of the use of lethal methods than respondents from other parts of the state.

Wildlife Services and MDNR personnel are experienced and professional in their use of WDM methods. As permitted depending on the alternative selected, wolves would be trapped, captured by cable restraints, or shot by experienced personnel as humanely as possible using the best methods available. Tranquilizer trap devices (TTDs) can be used on wolf traps to reduce the incidence of self-inflicted injuries by captured animals. All activities would be conducted in accordance with USFWS permit requirements and Michigan wolf trapping guidelines which require that traps be checked at least once every 24 hours. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed.

Some individuals would consider lethal removal of depredating wolves to be inhumane because they oppose all lethal methods of damage management. Others will be opposed to this alternative because they object to specific lethal WDM methods like traps and cable restraints and perceive these methods as being unjustifiably cruel and inhumane. It should be noted, that some use of these methods will occur no matter what the alternative selected, although the extent of use will vary as discussed in the EA. Some individuals would prefer that cage traps be used to capture wolves and would perceive this method as being more humane than traps and cable restraints. Unfortunately, the use of cage traps to capture wolves is both impractical and ineffective because it is extremely difficult to get a cage trap big enough for an adult wolf into remote locations, and because it is rare to capture an adult wolf in a cage trap. Individuals with animals that have been injured, threatened or killed by wolves may see this alternative as being more humane because it has the greatest likelihood of preventing further injuries to their livestock and pets. Effects on this issue remain as discussed in the EA.

6.2.2 Alternative 5 – Research Option - Permit for Lethal Removal Only Issued for WDM Research

As with Alternatives 1 and 2 in the EA, opinions on the humaneness of this alternative will vary depending on individual perspectives and values. Individuals opposed to the use of lethal WDM methods will still consider this alternative inhumane. Some livestock owners will likely consider it inhumane not to do everything possible to reduce wolf predation on animals under their care, including lethal removal of wolves (i.e., implement Alternative 2).

Foot-hold traps would be used for nonlethal and lethal WDM and wolf population monitoring. Some individuals consider the use of foot-hold traps inhumane even when used as a live-capture method for nonlethal WDM. A portion of the individuals who would otherwise be opposed to the use of lethal methods, and others who might oppose a nonlethal only alternative may tolerate this alternative for a short period (e.g., 1-2 years) because they value the information that will be obtained from a comparison of nonlethal and lethal WDM strategies.

Wildlife Services and MDNR personnel are experienced and professional in their use of WDM methods. Under this alternative, wolves would be trapped, snared, or shot by experienced personnel as humanely as possible using the best methods available. All activities would be conducted in accordance with Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target

and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed.

While damage methods are restricted, some property owners may take illegal action against localized populations of wolves out of frustration with continued damage and lack of legal access to the full range of WDM methods. Some illegal methods, like poisons, may be less humane than methods that would be used by experienced agency personnel. While this is not presented as an argument to justify a decision on the merits of any particular agency decision, it is important to recognize that the lack of legal alternatives to manage problem wolves does create a problem relative to public sentiment and the political climate in which agency personnel operate.

6.3 Effects on Public and Pet Safety

6.3.1 Alternative 2 - Integrated WDM (Proposed Action/No Action Alternative)

There are two ways that WDM activities may affect human and pet safety. The first is through risks to human and pet safety from the use of WDM methods, the second is benefits to human and pet safety from WDM actions conducted to reduce risks and threats to human and pet safety from wolves. There have been no reported injuries to WS or MDNR personnel or the public from wolf management activities in Michigan during the period of 2006-2008. WS did provide technical assistance (advice) for twelve instances where individuals were concerned about risks to human safety from wolves and one instance when a pet was killed by wolves. In these situations, wolf damage management activities had a beneficial impact on human safety. The EA concluded that WS' WDM activities would not have a significant adverse impact on human health and pet safety. Analyses of the data available since the completion of the EA indicate that this conclusion is still valid.

6.3.2 Alternative 5 – Research Option - Permit for Lethal Removal Only Issued for WDM Research

As discussed in the EA for Alternatives 1 and 2 and for Alternative 2 above, risks to human and pet safety from WDM methods would continue to be very low. The ESA allows for the use of lethal methods if needed to reduce a demonstrable risk to human safety from wolves. Consequently, response to threats to human safety are unlikely to vary substantially among alternatives.

The research program would only involve properties with verified livestock damage. Situations where there is a risk to pet safety from wolves would only be impacted by the study if the risks occurred in conjunction with verified depredation on livestock. Consequently, impacts of this alternative on human health and safety are expected to be similar to Alternative 1.

There would also be the potential risk to human and pet safety from the use of WDM methods. However, as noted above for Alternative 2, there have been no reports of injuries to WS or MDNR personnel or the public from wolf management activities in Michigan during the period of 2006-2008 (i.e., since the completion of the EA). Nor have there been any records of WS nontarget take of a cat or dog during wolf damage during Michigan WS wolf damage management activities.

6.4 Impacts to Stakeholders, Including Aesthetics of Wildlife

6.4.1 Alternative 2 - Integrated WDM (Proposed Action/No Action Alternative)

As discussed in the EA (USDA 2006), the Michigan Wolf Management Plan (MDNR 2008), and the review of social and biological science relevant to wolf management in Michigan (Beyer et al. 2006) public attitudes toward and tolerance of wolves and conflicts with wolves are highly varied. This variation in perspective and the passionate feelings individuals can have regarding wolves are reflected in public surveys (Beyer et al. 2006) and comments received on the EA. The Michigan Department of Natural Resources (MDNR) has been proactive and energetic in surveying public opinions and supporting partners' efforts to understand public opinion of wolf management in Michigan (Beyer et al. 2006).

In general, Michigan residents are supportive of the presence of a wolf population in the state, although individual perceptions of the appropriate size of the wolf population and the approach to be used to address conflicts with wolves may vary considerably (Beyer et al. 2006). The extent and nature of an individual's exposure to wolves and perception of threats from or competition with wolves plays a key role in determining whether or not an individual will be supportive of the presence of wolves and individual perceptions of the appropriate size of the wolf population. In the 2005 survey of Michigan residents (Beyer et al. 2006), tolerance of wolves by rural residents living in wolf range (i.e., the Upper Peninsula) was usually lower than tolerance by urban residents living outside wolf range. This is consistent with surveys of public attitudes toward wolves from other areas of the world (Decker et al. 2006, Karlson and Sjöström 2007, Naughton-Treves et al. 2007).

Depending on an individual's perspective regarding wolves, the presence of wolves can either enhance or detract from aesthetic and recreational enjoyment of an area. In the 2005 survey of Michigan residents, almost one half of interested citizens stated that they would not change their choice of recreational area based on the presence of wolves (Beyer et al. 2006). Seventeen percent of respondents indicated that the presence of wolves might make them more likely to visit a site, while 22% of interested citizens responded that they would be less likely to visit an area if wolves were present.

6.4.2 Alternative 5 – Research Option - Permit for Lethal Removal Only Issued for WDM Research

The impacts of this alternative to stakeholders would primarily depend on their values towards wildlife and their relationship to the damage problem. Livestock owners who perceive an integrated approach including lethal methods as having the greatest likelihood of successfully resolving wolf conflicts would probably prefer this alternative to Alternative 1, but consider it less desirable than Alternative 2. Individuals opposed to lethal removal would likely oppose this alternative because some wolves would be removed.

As discussed in EA Section 2.1.5.2, wolves have high nonconsumptive (viewing, calling, photographing) and indirect values (e.g., spiritual, and existence values) for many people. The ability to view and aesthetically enjoy wolves at a particular site could be temporarily limited if the wolves are removed. New animals would most likely use the site in the future, although the length of time until new wolves arrive is variable, depending on the habitat type, time of year, and population density of wolves in nearby areas. Given the increasing number of wolf packs in Michigan this alternative is not expected to reduce the overall wolf population in Michigan. Opportunities to view, call and aesthetically enjoy wolves would be available to people who make the effort to visit sites with adequate habitat outside of the area where lethal methods are used. Incidence of this type of impact will be less than with Alternative 2, but greater than with Alternatives 1, 3 and 4.

6.5 Impact on Non-target Species Populations

6.5.1 Alternative 2 - Integrated WDM (Proposed Action/No Action Alternative)

The agencies use the WS Decision Model (Slate et al. 1992) thought process to select the most effective and selective methods for each wolf damage management situation. WS Specialists are trained in the safe and proper use of the most selective and effective tools for capturing wolves. All foothold traps are equipped with pan tension devices to exclude some smaller non-target animals. Cable restraints are equipped with “stops” to prevent the device from restraining smaller non-target species and ungulates. Michigan WS biologists review scientific literature, collaborate with other wolf biologists/specialists, and attend wolf symposiums routinely, and will adapt new techniques if they are developed and become available for use. WS is currently using the most effective and selective management techniques available to resolve wolf damage complaints in Michigan.

Wildlife Services helps to reduce impacts on non-target species by ensuring that WDM actions are only conducted in response to damage by wolves. For example, in 2008, site investigations revealed that 3 instances of suspected wolf predation were attributable to coyotes and in one instance the livestock death was the result of disease. WS and/or MDNR specialists scrutinize every complaint and will only document a complaint as verified-wolf if sufficient evidence is present.

Despite the preventive measures discussed above and in the EA, wolf damage management activities do pose some risk to non-target species. WS non-target take for the period of 2006-2008 is summarized in Table 5. Not all coyotes reported as killed in Table 5 were unintentionally killed during WDM. Some coyotes were live-captured and subsequently euthanized because the property also had a history of problems with coyote predation on livestock. In these instances, the livestock producer may request that WS euthanize all coyotes captured while WS is working to solve depredation problems with wolves.

Table 5. Michigan WS non-target take associated with the wolf damage management program relative to licensed harvest by hunters and trappers for Fiscal Years^A 2006-2008.

Species	WS Take of Non-target Species Killed(Released)			Licensed Harvest		
	2006	2007	2008	2005-2006	2006-2007	2007-2008
Black Bear ^B	(2)	(2)	(2)	2,210	2,693	2,181
Coyote ^C	3(15)	(8)	17(3)	24,736	20,793	20,219
Bobcat ^C	(5)	(2)	(1)	868	946	660
Red Fox ^C	(1)	0	0	7,726	9,557	8,841
Badger ^C	(2)	(1)	0	214	326	203
White-tailed deer ^D	0	(1)	0	417,251	455,969	483,984

^A Federal Fiscal year runs from 1 October to 30 September.

^B Frawley 2008a

^C Frawley 2008b

^D Frawley 2008c

The implementation of various wolf damage management strategies since the completion of the EA in 2006 has not resulted in any unintentional take of state or federally-listed Threatened or Endangered species. This is consistent with the predictions made in the EA.

The EA concluded that although the use of foot-hold traps and cable restraints for nonlethal and lethal wolf damage management and research would result in the unintentional death of some animals, the level of take would be low and would not adversely impact non-target species populations. Non-target take which has occurred since the completion of the EA has remained at levels consistent with those analyzed in the EA. Data available since the completion of the EA indicates that this is still the case. Impacts on non-target species are expected to remain as analyzed in the EA.

6.5.2 Alternative 5 – Research Option - Permit for Lethal Removal Only Issued for WDM Research

Under this alternative lethal WDM activities would only occur at a limited number of sites. However, WS and the MDNR would also use traps and snares to capture wolves for wolf population monitoring and some non-lethal WDM methods. Total use of traps and snares by agency personnel is likely to be slightly greater than with Alternative 1 and similar to or slightly lower than with Alternative 2.

All actions would be conducted in accordance with Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed. As with Alternatives 1 and 2, trap and snare selection, settings (stops on snares, pan tension devices, etc.), placement and lures would be designed to minimize risks to non-target species. Measures used by the agencies to prevent injuries and keep wolves alive in traps and snares also reduce risks to non-target species. Methods to reduce risks to non-target species are discussed in the EA section on Standard Operating Procedures (Chapter 3) and in Appendix B.

Unfortunately, despite these precautions, traps and snares may occasionally capture non-target species such as white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), bobcat (*Felis rufus*), coyote and dogs⁵ (Table 5). Overall risks to non-target species from legal WDM actions would be similar to or slightly lower than Alternative 2 (no action / proposed action). These risks are very low and take is anticipated to be well below the sustainable harvest level for non-target species populations.

Some individuals frustrated with wolf management policies might attempt to illegally shoot, trap, snare, or poison wolves with potential detrimental effects on non-target species including threatened and endangered species (Schueler 1993, USDA 1997, Revised). Illegal use of toxicants represents one of the cheapest forms of predator removal, but it also presents the greatest environmental risks (Allen et al. 1996). Under this alternative, risks to threatened and endangered and other non-target species from illegal actions, especially the use of poisons, would probably be greater than Alternative 2. This alternative does not include the use of any new methods or techniques that have not already been addressed in the EA for Alternatives 1 and 2. Risks to state and federally-listed threatened and endangered species from WDM methods as discussed for these two alternatives.

This alternative does not include the use of any new methods or techniques that have not already been addressed in the EA for Alternatives 1 and 2. Risks to state and federally-listed threatened and endangered species from WDM methods as discussed for these two alternatives.

⁵ Michigan WS has not captured any dogs or cats over the interval of 2000-2004, but in rare instances, dogs and cats have been captured in other states during similar wolf management efforts.

VII. SUMMARY OF IMPACTS

The EA and Supplement recognize that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Cumulative impacts of other factors such as development and environmental variables, while not quantified, are reflected in the status of the wolf population and wolf population trends. Based on the analysis in the EA and this supplement, no single or cumulative adverse environmental consequences are expected to result from the proposed action/no action alternative or from Alternative 5 which was analyzed in this supplement.

When used in accordance with all appropriate Federal, State and WS requirements and guidance, impacts on non-target species from the proposed methods would be extremely low. None of the federally protected threatened, endangered, or candidate species listed by the USFWS or MDNR in Michigan would be jeopardized by the proposed action (J. Smith, USFWS, August 12, 2003; L. Lewis, USFWS, May 9, 2001). Economic and social impacts would primarily be beneficial, although some segments of the human population are opposed to the killing of wolves. Negative impacts to the physical environment would be non-existent.

Any localized reduction of wolf populations would likely be short term as habitats are reoccupied by individuals from the surrounding areas. All actions would be conducted in strict compliance with the requirements set by the USFWS for wolf management and associated policies and agreements between MDNR, WS, USFWS and Tribes. The proposed action may have negative effects on individual wolves but will not result in declines in the state wolf population, and, in fact, is expected to result in a net benefit to the Michigan wolf population. Based on past experience with the WDM programs in Minnesota, Wisconsin and Michigan, the Michigan wolf population will continue to grow even with the intentional and incidental take anticipated for Alternative 2 and all other cumulative impacts on the wolf population until it reaches limits imposed by the availability of food and suitable habitat.

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